

Three New Species of Interstitial Collembola (Insecta) from Sand Dunes of South Korea¹⁾

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ABSTRACT

Seven species of interstitial Collembola are identified from South Korean sand dunes. Three of them are new to science, *Willemia koreana*, *Onychiurus mariangeae* and *Protaphorura kwona*. This is the first report of Collembola inhabiting coastal milieu from the Korean peninsula.

Key words: Collembola, taxonomy, littoral sand, Korea

INTRODUCTION

Within the category of the study on interstitial Collembola populations we carried out a field work of several littoral sand beaches in South Korea in September-October 1991 and 1992. No interstitial Collembola from Korea has ever been studied although about 177 species of Collembola have been reported from edaphic and cave environment of the peninsula. Mesofaunal specimens were taken from surface of water with sand in the bucket and Collembola were sorted out under the stereomicroscope.

Hypogastruridae

1. *Willemia koreana* n. sp. (Figs. 1-4)

Type locality. South Korea, sand beach of the Byunsanbando National Park (70 km W-S-W of Jeonju). 13 Oct. 1991, leg. J.-M. Thibaud

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Type deposit. Holotype (♀), Collection of Museum National d'Histoire Naturelle, Laboratoire d'Entomologie, Paris (M.N.H.N.); one paratype ♀ in M.N.H.N.; one paratype ♀ in Jeonbug National University, Jeonju.

Additional material. South Korea, sand beach of Kundian (50 km from Seoul), 14 Oct. 1991. leg. J.-M. Thibaud, 1 ex.

Description. Length of the holotype: 0.4 mm, female paratypes 0.25-0.4 mm. Body white in color, integumentary grain rather developed on dorsal and ventral sides. Antenna 0.8 times shorter than head diagonal, its segments related in length as I:II:III:IV = 1:1.3:1.9:2.3. Ant. I with 6-7 setae, Ant. II with 12 setae and Ant. III with 18 setae respectively. Third antennal organ (III AO) composed of 2 internal cylindrical sensory setae, protected partially by an integumentary fold, two guard sensory setae twice as long as internal sensory setae and a few ventral microsensory setae (Fig. 1). Ant. IV with 6 cylindrical sensory setae: 4 thick and two rather fine ones, a subapical organite, a simple spherical apical vesicle and a microsensory seta. Postantennal organ (PAO) consists of 6 vesicles, rarely 7 or 8 vesicles (Fig. 2). Mouthparts well developed. Tibiotarsus each with 16 ordinary setae. Claws plump, curved and deficient of teeth, unguiculus absent (Fig. 3), with only a small projection in place.

Dorsal chaetotaxy same as in *W. scandinavica* Stach, 1949 (Fig. 4). Presence of 2 + 2 sensory setae (m7 and p4) on Th. II and III and 1 + 1 on Abd. I to V (p4; p3 on Abd. V). Setae m7 (Th. II and III) and p4 (Abd. II to IV) in shape of "candle flame". Ventral tube with 4 + 4 distal setae. Anal valves with chaetotaxy same as in *W. scandinavica*. Two small anal spines slightly curved.

Remarks. This new species is very close to the holarctic *W. scandinavica* by the presence of cylindrical sensory setae at antennal segment IV and small anal spines, head and antennal ratio in length, form and number of tubercles at postantennal organ (PAO) and finally by the same dorsal and anal chaetotaxy. The present species, however, is differentiated by absence of unguiculus, relative length of sensory setae of III AO, body size and by the shape of sensory setae on Th. II and III as well as on Abd. I to V.

2. *Hypogastrura manubrialis* (Tullberg, 1869)

Material examined. From sand dunes of Kumgang River at Kongju, 1 Oct. 1992, leg. J.-M. Thibaud, 2 ex.

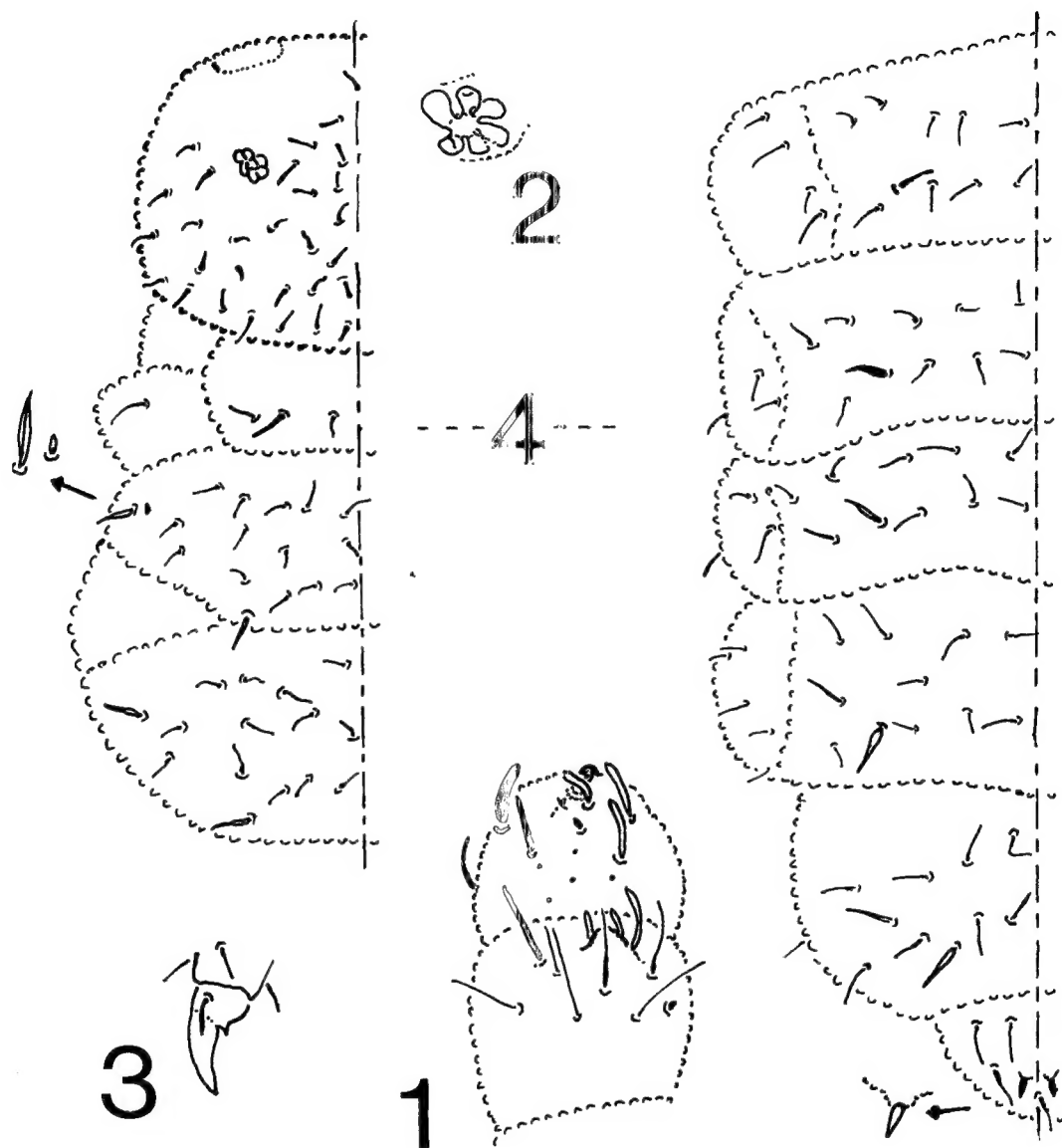
Remarks. The two individuals are small in size (600 µm) although they are adults. As cosmopolitan it was also known from Japan in Asia but is of new record for Korea.

3. *Ceratophysella bengtssoni* (Agren, 1904)

Material examined. From coarse sand of Kampo beach (30 km E. from Kyongju), 27 Sept. 1992, leg. J.-M. Thibaud; 2 ex. in slide preparation and 3 ex. in alcohol. From coarse sand of the artificial beach at Incheon; 6 Oct. 1992, leg. J.-M. Thibaud; 1 ex.

4. *Ceratophysella communis* (Folsom, 1897)

Material examined. From sand bank of the Miryang River (50 km S.E. of Daegu); 28 Sept. 1992, leg. J.-M. Thibaud; 2 ex. and one dozen in alcohol. Sand bank of Kumgang River at Kongju; 1 Oct. 1992, leg. J.-M. Thibaud, 4 ex.



Figs. 1-4. *Willemia koreana* n. sp.: 1, Dorsal view of Ant. III and IV; 2, Postantennal organ; 3, Hind claw; 4, Dorsal chaetotaxy

Distribution. As Asiatic species it was known from Japan, China, Taiwan, Korea, Sumatra, Southern India and Himalaya.

Onychiuridae

5. *Mesaphorura yosii* (Rusek, 1967)

Material examined. Is. Jeju, from sand beach of Hallim, 11 Oct. 1991, leg. J.-M. Thibaud. 6 ex.

Distribution. As cosmopolitan species, first described from China and later from North Korea, Vietnam and Java. New record for South Korea.

6. *Onychiurus mariangeae* n. sp. (Figs. 5-7)

Type locality. South Korea, sand beach of Byunsanbando National Park (70 km W.S.W. of Jeonju); 13 Oct. 1991, leg. J.-M. Thibaud.

Types deposit. Holotype (♀) in collection of M.N.H.N., Entomology Laboratory, Paris; one ♂ and one ♀ paratype and a dozen in alcohol in M.N.H.N.; one paratype ♀ in Jeonbug National University, Jeonju.

Additional material examined. South Korea, sand beach of Kundian (50 km S.W. of Seoul), 14 Oct. 1991, 4 ex. and a dozen in alcohol; sand beach of Naksan (20 km S. of Sokcho), 2 Oct. 1991, 2 ex.; Is. Jeju, sand beach of Hamdok (to north), 9 Oct. 1991, 1 ex.; Is. Jeju, sand beach of Isthmus Songsan; 10 Oct. 1991, 2 ex.; Is. Jeju, sand beach of Hallim (to west), 11 Oct. 1991, 2 ex.; artificial beach with coarse sand in Incheon: 6 Oct. 1992, 1 ex. juv.; sand of the Miryang River in Miryang (50 km S.E. of Daegu), 28 Nov. 1992, 2 ex. and a dozen in alcohol. All collected by J.-M. Thibaud.

Description. Length of holotype ♀ 500 μ m, paratypes ♂ and ♀, 500-650 μ m. Body white in color. Antenna short. Ant. I with 7 or 8 setae, Ant. II with 12 or 13 setae, Ant. III with 19 setae of which 5 as guard setae of IIIAO. IIIAO consists of 4 protecting papillae on the finely granulated integument, 2 smooth sensory setae in shape of large racket and 2 rod-shaped sensory setae, latero-external microsensory setae in a crucible (cf. Fig. 43 of Rusek, 1967 for *Onychiurus foliatus*). Ant IV with poorly differentiated sensory setae with the exception of 2 or 3 well visible ones, dorso-external microsensory setae in a crucible and rod shaped apical sensory setae in a crucible.

Postantennal organ (PAO) with 10 to 13 multilobed vesicles in shape of "bunch of grapes", well separated one another (Fig. 5).

Unguis without internal teeth. Unguiculus with a very narrow lamella and a rather long filament (Fig. 6). No furcal vestige and 4 setae present in its place. Two anal spines very long (9-10 μ m), thick, mounted each on short papilla. Ratio of unguis III (ventral): anal spine = 1.3:1.

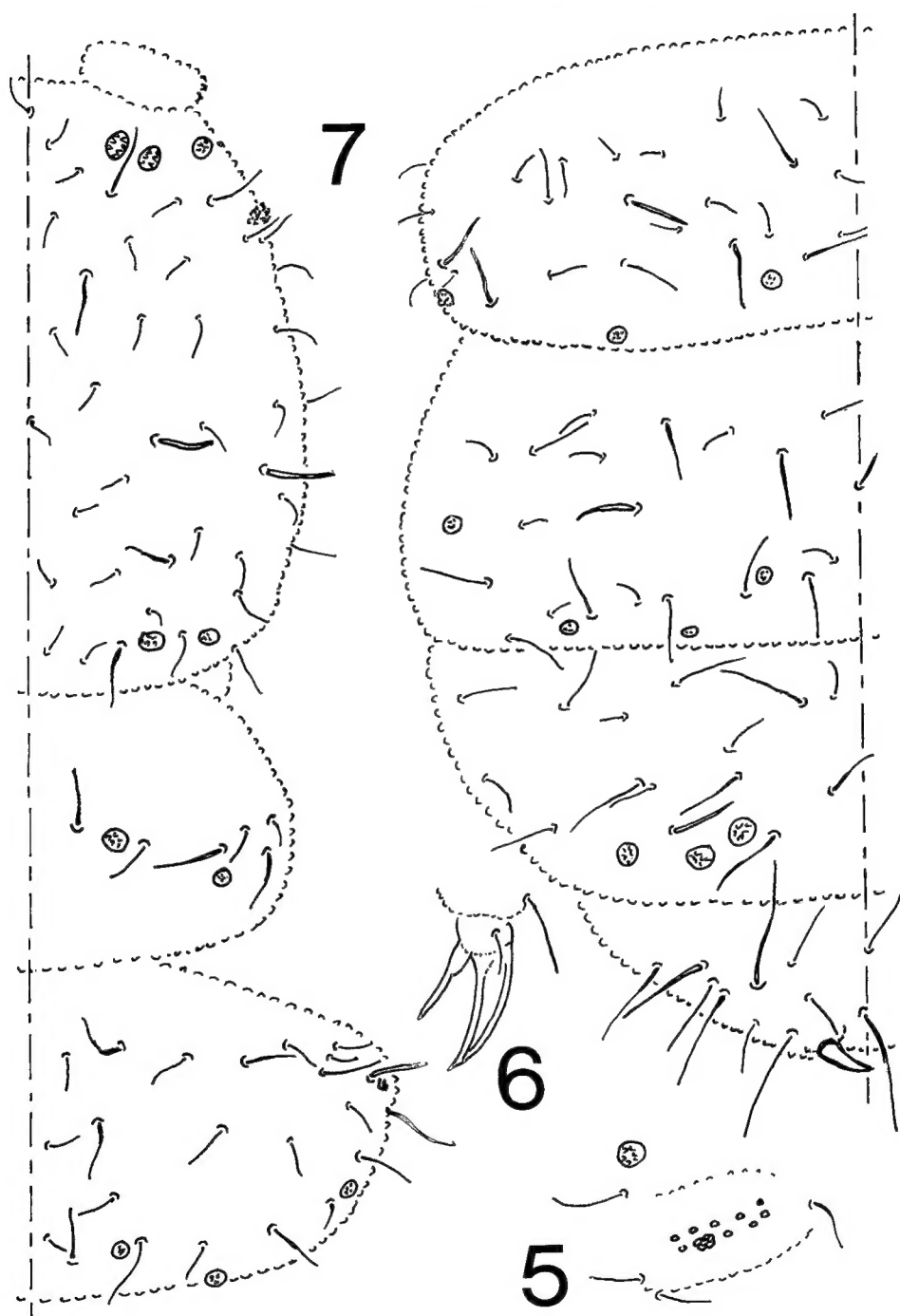
Formula of dorsal pseudocellae: 32/233/33343. One of the pseudocelles of Abd. I, II and III in lateral position. Their asymmetry on the same abdominal segments: 3 + 2 and on Th. I: 2 + 0 to be noted.

Ventral pseudocellae formula: 2/000/11120. On the head one of the pseudocellae ventral, the other in latero-posterior side. On Abd. I pseudocellae near ventral tube, on Abd. II lateral and one of the two on Abd. IV located the same way. Also 2 pseudocellae present in each subcoxa.

Dorsal chaetotaxy (Fig. 7) with 2 types of setae, macrosetae and mesosetae. Also the presence of setae thicker and of rounded apex notable: 1 or 2 on the head, 1 on each segment of Th. II, III and Abd. I - V. Lateral microsensory setae on Th. II and III. Two median setae on head and Abd. VI each and one on abd. IV also notable. Asymmetry of setae often observed. On each thoracic sternite 1 + 1 setae. Ventral tube with 6 + 6 setae surrounded by 2 setae each side.

On genital area ♂ with 3 + 3 setae, thick and in shape of "candle flame" like in *O. foliatus*.

Remarks. The present new species is close to *O. volinensis* Szeptycki, 1964, described with 2 individuals from littoral sand dunes of the Is. Wolin (N.W. of Poland) on the Baltic Sea and especially resembles *O. foliatus* Rusek, 1967 described with 18 individuals from termite nest in a park of Shanghai, China. It is differentiated, however, by dorsal as well as ventral pseudocellae formulae and by the number of vesicles on PAO.



Figs. 5-7. *Onychiurus mariangeae* n. sp.: 5, Postantennal organ; 6, Hind claw; 7, Dorsal chaetotaxy; Hd., Th. I and II, Abd. III-VI

Derivation nominis. Very much cordially dedicated to Marie-Ange Delamare Deboutteville with thanks to her very devoted and efficient work.

7. *Protaphorura kwona* n. sp. (Figs. 8-10)

Type locality. South Korea: Is. Jeju, sand beach of Isthmus Songsan. 10 Oct. 1991, leg. J.-M. Thibaud.

Type deposit. Holotype (♀) in collection of M.N.H.N., one paratype ♀ in Jeonbuk National University in Jeonju.

Additional material examined. South Korea: Is. Jeju; beach of Hamdok, 9.Oct.1991; 1 ♂ and 1 ♀; sand dune of the Miryang River at Miryang (50 km south of Daegu), 28.Nov.1992; 7 ex. and twenties in alcohol; sand dune of the Changdo River (40 km south of Daegu), 28 Nov. 1992; 2 ex. and a dozen in alcohol. All collected by J.-M. Thibaud.

Description. Body length of the holotype 650 μ m, paratypes 550-750 μ m. Body white in color. Antenna 0.8 times shorter than head diagonal. Ant. I with 8 setae, Ant. II with 13 setae; Ant. III with 19 setae of which 5 as guard setae of IIIAO, composed further of 5 papillae with fine granulated integument, 2 rod-shaped sensory setae and 2 sensory setae of plump morula shape (Fig. 8); some latero-external microsensory setae situating in a crucible. Ant. IV with sensory setae poorly developed; rod-shaped dorso-external microsensory setae also in a crucible and some rod-shaped apical sensory setae in a crucible.

PAO of type of *Protaphorura* gr. *armata* with 28 long simple elements in vertical angle to its axis.

Unguis without internal teeth. Unguiculus, without lamella, filament rather long (Fig. 9). No furcal vestige. Two anal spines long (18-20 μ m), thick and curved, mounted each on a papilla and as long as the ventral side of unguis III.

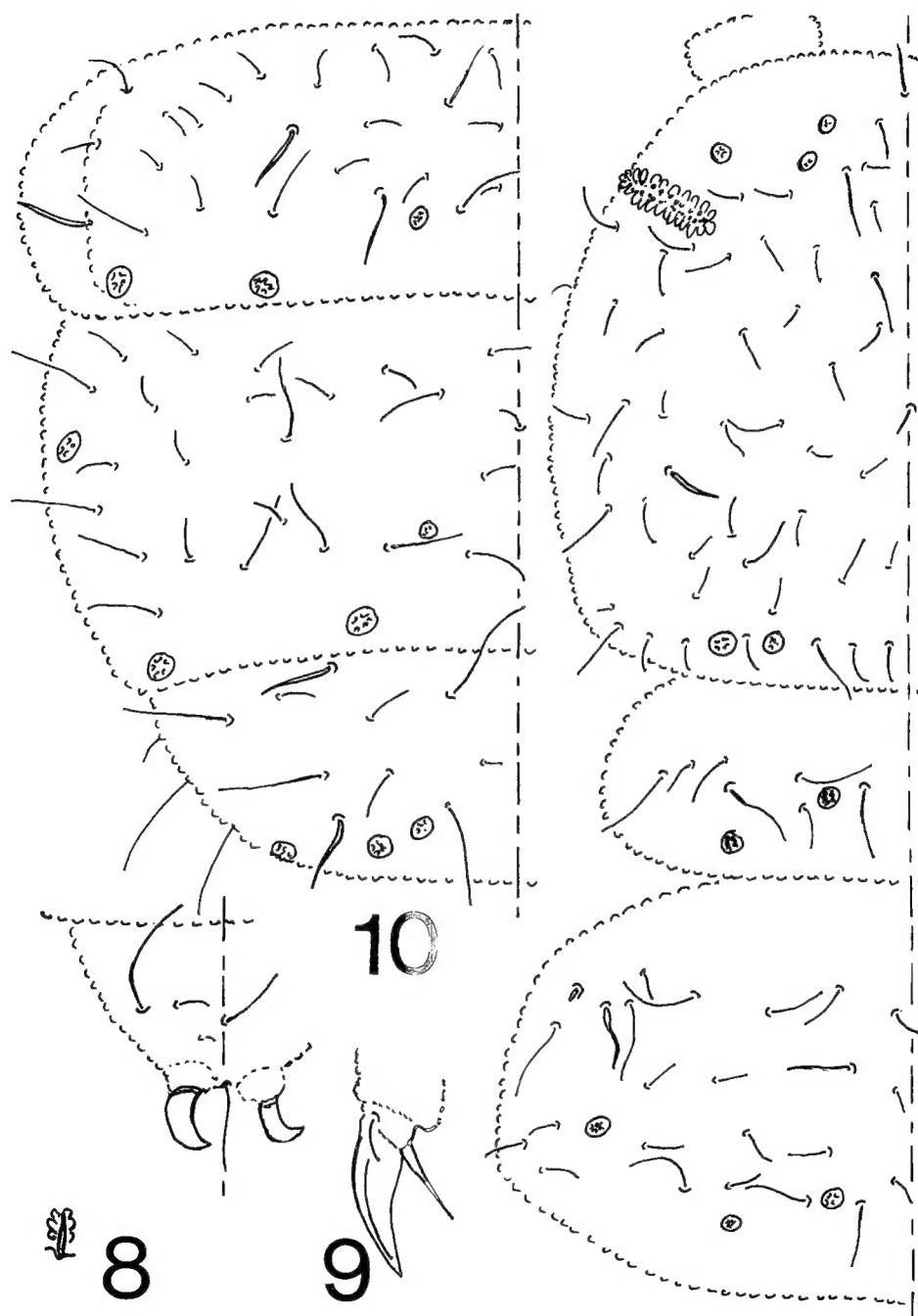
Dorsal pseudocellae formula: 32/233/33343. Ventral pseudocellae formula: 11/000/11120. Two pseudocellae present in each subcoxa.

Dorsal chaetotaxy (Fig. 10) with 2 types of setae: macrosetae and mesosetae. Thicker setae notable: 1 each on head, Th. II and III, 2 on Abd. I-III, Abd. V. Lateral microsetae on Th. II and III present. Also 2 median setae on Hd. and Abd. VI present and one on Abd. IV. Also some asymmetric setae present often.

On each thoracic sternite 1 + 1 setae. Ventral tube with 6+6 setae and surrounded by 2 setae each side.

Remark. Present new species is very close to *Onychiurus* (*Protaphorura*) *yodai* Yosii, 1966 described from Nepal and later found from Japan. It is differentiated by round sensory setae in shape of "grape chubby" in IIIAO, by its dorsal chaetotaxy (head: p3, p4 and p5 surrounding 2 posterior pseudocellae and Th. II and III with 4 rows of setae instead of 3; some thick setae present), and by the presence of 4 pseudocellae on Abd. IV and not 3; and finally ventral pseudocellae formula different.

Derivation nominis. Present species is cordially dedicated to our colleague Prof. Yong-Jung Kwon of Kyungpook National University in Daegu who so kindly took care of me (Thibaud) during my two-day stay in the city.



Figs. 8-10. *Protaphorura kwona* n. sp.: 8, Sensory setae of Ant. III; 9, Hind claw; 10, orsal chaetotaxy; Hd., Th. I and II, Abd. III-VI.

DISCUSSION

It certainly is too early to draw any picture of distributional pattern of sand dune Collembola from Korea with such a small number of species made available for study from the present material. Our observation of seven species in six genera from only two families, however, are quite suggestive of possibly far more diversity of taxa to be uncovered in the future considering the small amount of material from only several localities.

Their geographic affinities all were demonstrated to be close to Japan and South-East Asian regions.

REFERENCES

- Rusek, J., 1967. Beitrag zur Kenntniss der Collemola Chinas. Acta. ent. bohemoslav., 64: 184-194.
 Stach, J., 1949. The Apterygotan fauna of Poland in relation to the world-fauna of this group of Insects. Acta. Monogr. Mus. Hist. Nat., Cracovie: 1-341.
 Szeptycki, A., 1964. Two new species of Collembolan from Wolin Island (north-west Poland). Bull. Entomol. Pologne, 34: 171-176.
 Yosii, R., 1966. Collembola of Himalaya. J. Coll. Arts and Sciences, Chiba Univ., 4: 461-531.

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韓國産 砂丘性 톡토기 3 新種에 관한 보고

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요 약

남한의 해안가 砂丘에 서식하는 톡토기(곤충강)를 관찰한 결과 3 新種 *Willemia koreana*, *Onychiurus mariangeae* 그리고 *Protaphorura kwona* 등 모두 7종이 밝혀져 이를 보고한다. 본 연구는 한반도 해안에 서식하는 톡토기에 대한 최초의 분류학적 연구이다.